

SCIENCE

[Entered at the Post-Office of New York, N. Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

EIGHTH YEAR.
VOL. XV. No. 385.

NEW YORK, JUNE 20, 1890.

SINGLE COPIES, TEN CENTS.
\$3.50 PER YEAR, IN ADVANCE.

THE CHEROKEES IN PRE-COLUMBIAN TIMES.

IV.

HAVING traced back the tribe by the mound evidence thus far along the traditional line of migration with strong probability of being correct, we are prepared to take another backward step. As will be observed by the careful reader, reliance has been placed in this investigation upon what appear to be indications of peculiar customs. Connection with the group of which the great Grave Creek tumulus forms a prominent feature seems to be established, thus verifying the ancient "oration," or tradition, of which Haywood speaks. Allusion has also been made to the similarity, in some respects, of the works of the Kanawha group to those of Ohio, but there is more to be added on this point. Not only does it appear that it was a custom in both these sections to enclose the bodies of the dead in bark, to bury in wooden vaults, and to form at the bottom of mounds basin-shaped clay masses which have received the name "altars," but also to arrange wooden vaults the same way in the tumuli, and to build other structures similar to each other in form.

In confirmation of the statement in reference to the wooden vaults, attention is called to the description by Mr. H. L. Reynolds, in a recent bulletin of the Bureau of Ethnology, of a mound he explored in Paint Creek valley, Ohio. This is the "square truncated mound" shown on No. 1, Plate XXI, "Ancient Monuments," which, by its close proximity to the combined square and circular enclosures known as the "Baum Works," is supposed to bear some intimate relation thereto.

As the description has been published, it is only necessary here to allude to such portions as have a bearing on the question before us.

At the time it was measured by Messrs. Squier and Davis it was a hundred and twenty-five feet in diameter, and fifteen feet in height. Since then its annual disturbance by plough and freshet has reduced the height to twelve feet, and increased the diameter to a hundred and forty. The same agencies have likewise destroyed its pyramidal form, so that now it resembles an upturned basin. It was composed, for the most part, of clay mottled with black loam, and in some places with patches of a grayish, plastic lime. The prominent feature is the evidence that two large wooden vaults, or structures of some kind, had been built here, one above the other, as in one of the Kanawha mounds heretofore described. Both of these structures had been built of upright posts, five inches in diameter and ten inches apart, forming a regular circle thirty-six feet in diameter. The lower circle consisted of a single series, but the upper of two, eighteen

inches apart, the outer series standing directly over the posts of the lower structure.

Separating the two structures was what the explorer terms "a thin, sagging streak of burnt clay," but which reminds us strongly of the basin-shaped clay beds found in the mounds of East Tennessee and Kanawha valley. Here and there upon its surface were traces of black wood-ashes and a small quantity of white bone-ashes. Horizontal timber moulds, smaller in size than the posts, filled, in places, with charcoal, could be seen distinctly lying against the inside of each line of posts. These appear to have been cross-beams or stays used for bracing-purposes. On the east side there was a break in each circle, of three feet two inches, in which there were no post-moulds. Within each circle, at different depths, and placed without any apparent regularity, were several skeletons. Lying on the natural surface of the ground, running from the base of the lower series of posts toward the centre of the circle, were the remains of logs about eight inches in diameter. Directly over these timbers was a horizontal layer of decayed and burnt wood or bark, averaging half an inch thick. Notice should also be taken of the fact that this mound is on the lower level near the creek,—in fact, is one step or terrace below the bridge landing,—and is almost yearly surrounded by water from the overflow.

It is true that this mound shows some indication of being comparatively recent: in fact, Mr. Reynolds found in it a small piece of bone which he thought had been shaped with a steel knife. This supposition, if accepted, would seem to be incompatible with the theory that attributes works of this type to the Cherokees. We give the data, however, as they are, and will present our explanation further on.

We observe in this mound the somewhat unusual arrangement of one wooden structure above another, seen elsewhere only in the Kanawha and Grave Creek groups; we also notice that in each case the walls of these structures are formed by standing the timbers upright. There is, however, one particular worthy of note, in which those of the Ohio mound differ from the others; to wit, the much larger size of the former, suggesting the possibility that they were council-houses, and not vaults. But should this conclusion be adopted, we find parallels in the customs of the Cherokees and mound-builders of the Cherokee district.

Mr. Lucien Carr of Cambridge, Mass., explored a mound in Lee County, Va., in which were found indications of a large circular or oval wooden structure. From his description, as given in the "Tenth Annual Report of the Peabody Museum," we take the following extracts:—

"The mound in question, a truncated oval in shape,

stands alone on a gentle slope; and, having been in cultivation for many years, the wear and tear of the plough and the gradual weathering-away of the summit made it impossible to get at its exact measurements. A careful examination, however, showed it to be about three hundred feet in circumference at the base, and nineteen feet in height. . . . On the top was a level space, oval in shape, the diameters being respectively about fifteen and forty feet. At a distance of eight or ten feet from the brow of the mound, on the slope, there were found buried in the earth the decaying stumps of a series of cedar-posts, which, I was informed by Mr. Ely, at one time completely encircled it. He also told me that at every ploughing he struck more or less of these posts, and, on digging for them, some six or seven were found at different places, and in such order as showed that they had been placed in the earth at regular intervals and according to a definite plan. On the top, in the line of the greatest diameter, and near the centre of the mound, another and larger post or column, also of cedar, was found. . . . The location and regularity of these posts, and their position with reference to the central column, would seem to show that the summit of the mound at one time had been occupied by some sort of a building, possibly a rotunda or council-chamber, as the ground plan answers to the description of one which Bartram found in the town of Cowe on the 'Tanase' River among the Cherokees, the very people who formerly held all this section of country."

In the mound, and within the circle of posts, several skeletons were found placed irregularly and at different depths, as in the case of the mound opened by Mr. Reynolds. Mr. Carr further remarks that "there were found scattered about everywhere, throughout the whole of the upper half of the excavation, in different places and at various depths, beds of ashes, burnt earth, and charcoal,—usually cedar or chestnut,—sometimes one above and overlapping the other, with an intervening stratum of earth of greater or less thickness."

This is an important and interesting fact in comparing the works of the different sections alluded to.

Indications of similar structures were found in some three or four mounds explored by the bureau assistants in East Tennessee. In one case the series of posts was found at considerable depth, showing that earth had been added subsequent to its erection.

Adair says that "every town has a large edifice which with propriety may be called the mountain house in comparison of those already described. But the only difference between it and the winter house or stove is in its dimensions and application. It is usually built on the top of a hill, and in that separate and imperial state-house the old beloved men and head warriors meet on material business, or to divert themselves and feast and dance with the rest of the people."

The winter houses referred to were, according to his statement, made as follows: a sufficient number of strong, forked posts were fixed deep in the ground "at a proportional distance, in a circular form, all of an equal height, about five or six feet above the surface of the ground; above these they tie large pieces of the heart of white oak. . . . In the middle of the fabric they fix very deep in the ground four large pine posts in a quadrangular form."

According to Mr. Mooney,—who has furnished the writer with some particulars on the subject in addition to what are found in his paper heretofore mentioned,—on account of the sanctity attached to the location in the minds of the people, a new town-house was usually built upon the site of the old one. The Cherokee town-houses were necessarily located in the immediate vicinity of a stream, and where there was about it a level area. The reasons for this were (1) that the dances were held around and about these public houses, frequently beginning inside, and ending on the level area around them; and (2) ceremonial bathing formed an important part of the proceedings connected with their sacred dances, such as the green-corn dance and the medicine dance, where the whole body of the performers came out of the town-house to the water, and, after certain ablutions, returned thereto. It was necessary, therefore, that the building should be near a stream. As the level areas in their narrow mountain valleys are often overflowed, it is quite probable that in order to place these sacred houses above the floods, they were, as stated in tradition, located on artificial mounds. "Moreover," adds Mr. Mooney, "the town-house was the depository of numerous ceremonial objects which could not readily be removed in a sudden emergency. And, as it is said traditionally that a sacred fire was kept burning on a peculiar hearth excavated in the centre of the earthen floor, this could not be removed from the hearth-place, and hence some provision for its protection was necessary."

Whatever may be the opinion entertained in regard to the relation of the mound-builders of the different sections to each other, or be thought of Mr. Mooney's suggestions, it must be admitted that the above statement gives a satisfactory reason for placing the pyramidal mound of the Baum Works, Ohio, on the lower level near the creek, rather than on the higher level occupied by the square and circle.

In confirmation of Mr. Mooney's statement, we find the following in Adair's "History." Speaking of the Cherokees, he says, "Their towns are always close to some river or creek, as there the land is commonly very level and fertile, on account of the frequent washings off the mountains, and the moisture it receives from the waters that run through their fields. And such a situation enables them to perform the ablutions connected with their religious worship."

Another respect in which the Kanawha works resemble those of Ohio is the presence among them of enclosures, some of which are approximately true circles. There is also among the former a true "hill-fort," located on the top of a bold and partially isolated headland, overlooking the valley for some miles up and down the river.

We have now, as before stated, travelled back along the path of migration to the Ohio region, the mound testimony agreeing substantially at every step with the traditions. As we now enter a well-known field which has been somewhat thoroughly cultivated by archaeologists, and which is considered, in the minds of many antiquarians, sacred ground, we are aware that we must move with cautious steps, as any attempt to bring forward a new theory in regard to the ancient works of this region is attended with more than ordinary risk. It will therefore be appropriate to introduce at this point some general considerations which have a bearing on the questions at issue.

One result of the more recent explorations and study of the ancient works of the mound region is the conviction that the mound-builders were divided into numerous tribes, though belonging substantially to the same culture state, which was of a lower grade than that attained by the people of Mexico and Central America, and apparently somewhat less advanced than that of the Pueblo tribes of New Mexico and Arizona. However, there are no data to justify the belief that they pertained to different "races," using this term in its broad and legitimate sense. This assertion will, of course, be questioned by some of our archaeologists who base their conclusions in reference to this subject on the forms of the skulls. Without entering into a discussion of this question, which would draw too heavily on our space, and is not appropriate at this point, it may be asserted, with the assurance of being sustained by the facts, that the study of the forms of mound-builders' skulls has not been productive of any satisfactory results bearing upon the question of races or nationality. This is shown by the remarks of Mr. Lucien Carr, in his paper on the "Crania from Stone Graves in Tennessee," published in the "Eleventh Annual Report of the Peabody Museum:"—

"Names, however, are of but little import: the one central fact is to be found in the presence in these graves of skulls, which, after excluding those tabulated as distorted or much flattened, are shown by their measurements to belong to the two extremes of classification, and which cannot be brought into the same group without doing violence to all ideas of craniology. If the terms 'dolichocephalism' and 'brachycephalism' mean any thing, then these two forms of skulls are to be found here, and there is no method of measurement sufficiently elastic to include them both under one head. This fact is by no means new or novel, though it has not been many years since Dr. Morton and anthropologists of his school stoutly maintained the uniform brachycephalic type of crania among all the American aborigines except the Eskimo. Of late years, however, the contrary opinion, so ably advocated by Dr. D. Wilson, has been steadily gaining ground, and to-day there is little hazard in saying that it is generally received. But the evidence furnished by this collection seems to lead still farther; and we are required not only to admit the existence of different forms of skulls, as there well might be in different tribes, but also to conclude that they are to be found among the same people or peoples living under the same tribal organization, much after the fashion in which they are to-day known to exist among the composite peoples of our great commercial cities. This is hardly in accord with the opinion generally held as to the purity of race in prehistoric times; but it seems impossible to avoid the conclusion, if it be admitted that the fact that these skulls were found buried together indiscriminately in the same style or set of graves in the same mound, and so far as we can judge at or near the same time, is any proof that they belonged to people of the same tribe and race."

It will be seen from this conclusion of one best qualified to express an opinion on this subject, that a classification of the mound-builders upon the forms of the skulls is not only unsatisfactory, but is misleading and valueless. That the people found inhabiting the continent at the time of the Columbian discovery may have been, and probably were, derived from different races, is not denied. Possibly the

mound-builders of the section herein designated the "mound region" may have been derived from different races; but, if so, this cannot be determined by the crania found in the mounds of the Mississippi valley. Indications of tribal peculiarities, of variations in local customs depending on environment, and perhaps traces even of customs peculiar to certain stocks or families, are observed in the ancient works of the region indicated, but nothing whatever to suggest different races. This is a bold and venturesome statement to make, in view of what has been published on this subject; nevertheless the writer feels justified in making it, and believes that the data, when thoroughly studied, will sustain him.

The evidence of division into tribes is found in the numerous indications of intertribal warfare, such as the works of defence of various kinds met with in different sections. For instance, there are the hill-forts of Ohio, of which Fort Ancient is a well-known example. No one has ever doubted that these were constructed for defence. Nor is it likely the other enclosures, such as the circles, squares, and octagons, would have been ascribed to any other object but for the introduction of the theory of a semi-civilized, mound-building race, with its priesthood and religious ceremonies. Assume that the authors were the ancestors of the Indian tribes found inhabiting the country, and the idea of this overpowering religious influence vanishes at once. The enclosures of New York, Michigan, Kentucky, Tennessee, south-eastern Missouri, and the Gulf States, are admitted to be defensive works. In addition to these, there are in many places defensive walls and embankments across projecting spurs, peninsulas, and river bends. Village sites are also often found in positions which could have been selected for no conceivable reason except that they might be easily defended against attack.

The only reasonable explanation of these facts, and of the evidences of different customs found in the mounds, is that the mound-builders consisted of different tribes. Even in the comparatively limited area of Ohio are found abundant evidences of the presence of different tribes, and of successive occupation by different peoples. The same thing is true also of the areas embraced in eastern Iowa, Wisconsin, Illinois, Indiana, and Kentucky; but, on the other hand, western New York, a strip along the lake border of Ohio, and the Cherokee region of East Tennessee and western North Carolina, appear to be exceptions to this rule.

As the connection indicated between the works of the Kanawha valley and those of Ohio relates primarily to the sepulchral and so-called "sacrificial mounds," and secondarily to the geometric enclosures of the type found in the Scioto valley, attention is called to the latter.

Forty years ago, Messrs. Squier and Davis, while admitting that some of the enclosures of this State were built for defence, advanced the theory that a large number of the earth-works were designed for sacred or religious purposes, and places for performing superstitious rites,—a view which has generally been adopted by subsequent writers. That this theory was based upon a preconceived notion held by these authors, is apparent from the following statement in "Ancient Monuments:" "We have reason to believe that the religious system of the mound-builders, like that of the Aztecs, exercised among them a great, if not a controlling,

influence. Their government may have been, for aught we know, a government of the priesthood,—one in which the priestly and civil functions were jointly exercised, and one sufficiently powerful to have secured in the Mississippi valley, as it did in Mexico, the erection of many of those vast monuments which for ages will continue to challenge the wonder of men."

Dr. Daniel Wilson not only takes the same view in his "Prehistoric Man," but expands and emphasizes it. He even goes so far as to assert that the earth-works of the Iroquois present, in some respects, a greater contrast to those of the mound-builders (of Ohio) than the latter do to the elaborate architecture of Mexico and Yucatan. "They form groups," he continues, "of symmetrical enclosures, square, circular, elliptical, and octagonal, with long connecting avenues suggesting comparisons with the British Avebury, or the Hebridean Callernish; with the Breton Carnac, or even with the temples and sphinx avenues of the Egyptian Karnak and Luxor."

If we lay aside all preconceived notions of a highly cultured race of mound-builders with a priestly hierarchy, and study these remains in the light of such data as we possess, instead of looking at them through the halo of a finely wrought theory, the inappropriateness of such comparisons becomes apparent. What shall we say of the attempt to compare the dirt walls of these groups of combined circles and squares with the great temple of Karnak, termed by Fergusson "the noblest effort of architectural magnificence ever produced by the hand of man"? of likening the simple earthen parallels, thrown up perhaps with wooden spades, to the avenue of crio sphinxes, and the magnificent, columned hall of the Egyptian temple? In what respect do these earth-works of the mound-builders resemble the palace at Palenque, or Casa del Gobernador and House of the Nuns at Uxmal? It is only necessary to put the question: the reply is self-evident. Yet the writer just quoted, who may be taken as the leading representative of the school to which he belongs, sees, in some respects, less contrast between these two classes of structures than between the earth-works of the Iroquois and those of the mound-builders of Ohio.

Omitting, perhaps, a dozen geometrical works, the enclosures of Ohio, New York, and other sections, are admitted to be for defensive purposes, and are of a character conformable to savage life. And in reply to Dr. Wilson it may be truly affirmed, that if we compare the larger work on Plate XIX. of "Ancient Monuments"—which is in the immediate vicinity of the celebrated "Mound City," Ross County, O.—with that on Plate II. of Squier's "Aboriginal Monuments of New York," the similarity is so marked (except in size) that one might be substituted for the other without bringing into, or omitting from, the former group any important character. Yet here is what was considered by the authors of "Ancient Monuments" pre-eminently the sacred or religious city of the Ohio mound-builders; and, what is worthy of mention, the accompanying enclosure, so like that of New York, has a central mound, which was examined by Messrs. Squier and Davis, and pronounced by them "clearly a place of sacrifice."

A number of such general resemblances between the works of the two sections could be pointed out; yet it is admitted that the two classes of remains bear evidence of being

the works of different tribes, but not of different races, or of peoples in such widely different culture states as to justify Dr. Wilson's extravagant statement.

The complicated group, consisting of circles, a square, octagon, and parallels at Newark, is unquestionably the most noted, as well as the most extensive, of its class in the mound section. As these cover an area estimated at two miles square, what, it may well be asked, must be the estimate of the size and population of the village that required such an extensive system of works devoted to religious services and superstitious rites? The great circle at Avebury, England, the most extensive of the so-called druidical structures of Europe, embraces only about thirty-six acres; while here is an octagon enclosing fifty acres, one circle including twenty, another thirty, and a square embracing twenty acres. The race-track, buildings, and other appurtenances of the Fair Association of a county containing probably a hundred thousand inhabitants are enclosed in a single one of these circles. If these were but places where games were held and religious ceremonies performed, where are we to find the indications of the immense village that required such vast amphitheatres?

It is remarkably strange that the mound-builders of central and southern Ohio alone, of all the ancient peoples of the mound region, should erect such extensive structures devoted to religious observances; that here alone the priestly influence should have been sufficiently powerful to produce such results. How is the development of this sacerdotal element in this limited area to be accounted for?

It is true that a few of these enclosures are remarkably correct geometrical figures, and present a puzzling question to the archæologist; but the usual explanation, that the authors were a people in a much higher state of culture than the Indians, serves but to increase the difficulty. On the one hand, it is only necessary to suppose that they were built for defence, and that the Indians of a certain tribe and era had learned the art of laying off correctly circles of large size, and the problem is solved. But, on the other hand, the supposition of a highly cultured race, capable of forming these figures by means not within the reach or capacity of the more advanced Indians, introduces a host of still more troublesome questions. That the ancient works of the Southern States and of New York are to be ascribed to the Indians, is too clearly established by historical and other evidence to be longer denied; and it is even admitted, that associated with the prehistoric monuments of the valleys of the Muskingum, the Scioto, Brush Creek, the Little Miami and Big Miami, are mounds and works of later times, some of which were made by the historic tribes or their immediate ancestors. Notwithstanding this supposition of a much earlier occupation by a veritable mound-building people of advanced culture, there are works here ascribed to this people which present no indications of greater age than some of those attributed to Indians. How is this to be accounted for on the latter theory?

The fact, well known to all archæologists, that minor works of art are found in these typical monuments of the same character as those obtained from mounds attributable to the Indians, presents another question difficult to answer, on this theory. The "Monitor" pipe, or pipe with broad base running out in front and behind the bowl, is considered

typical of the people who built the "sacrificial mounds" and "sacred enclosures" of Ohio; yet, according to Adair, the Cherokees made pipes of precisely this pattern, as he says "the fore part of each commonly runs out with a sharp peak, two or three fingers broad and a quarter of an inch thick, on both sides of the bowl lengthwise; they cut several pictures with a great deal of skill and labour." This seems not only to connect the builders of these typical Ohio works with the Indians, thus presenting a difficult problem for the advocates of the above theory to solve, but forms another strong link in the chain of Cherokee history we are trying to follow. There are other difficulties in the way of this hypothesis which our limited space will not permit us to present. There are other questions, however, relating to these enclosures, which require notice here, as they have some bearing on the theory advanced in this paper, and must affect to some extent the conclusions reached.

This is probably implied in the Walam-Olum, where it is stated that "the Talega towns were too strong."

If the enclosures are defensive works, they present nothing incompatible with the theory herein advanced, but rather tend to confirm it. Even supposing they were intended for sacred or superstitious uses, they must have been constructed for the purpose of defending the gathered assemblies from sudden attack by enemies. Take, for example, the Baum Works shown in Fig. 1, Plate XIX., of the "Ancient Monuments," and copied in our Fig. 9. For what purpose were the walls built, except for defence? Is it to be supposed that they were intended solely as sitting-places for the spectators? Those around the square alone would have seated eight or ten thousand persons, and the wall of the circle as many more; yet the remains present no indications of an extensive village. We may also ask, with good reason, why one enclosure was square and the other

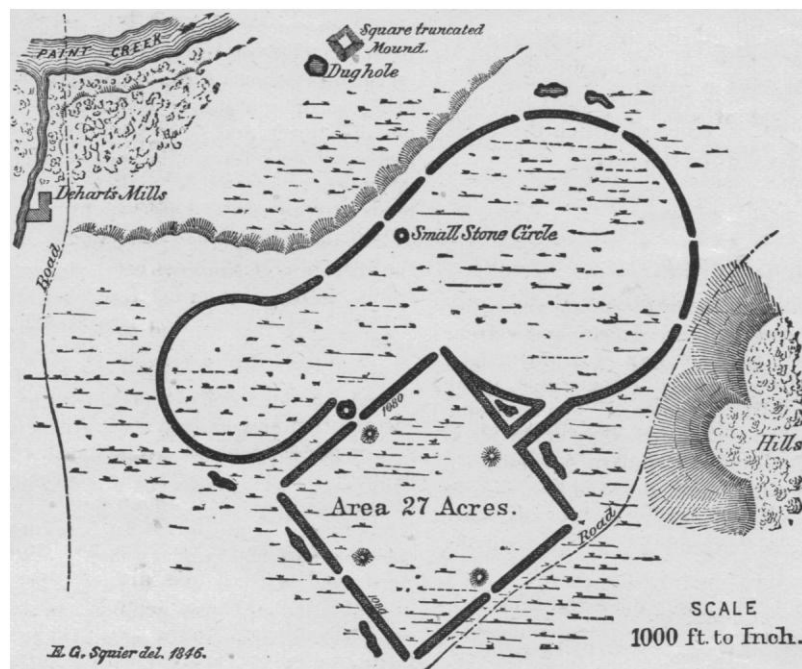


FIG. 9.

It is believed that the evidence presented will be accepted as sufficient to justify the supposition that the Tallegwi of tradition must be identified with the Cherokees, and that they formerly lived in the Ohio valley. Having shown that the people of this tribe built mounds in their historic seat, and were in all probability the authors of the Kanawha and Grave Creek works, it is reasonable to conclude that they built mounds and constructed other works during their residence in Ohio. If this be admitted, their identification with the Tallegwi would indicate that, during their long contest with the Delawares and Huron-Iroquois, they built defensive works, as it is stated in Heckewelder's version of the tradition, that "the enemy [the Tallegwi] fortified their large towns and erected fortifications, especially on large rivers and near lakes, where they were successively attacked, and sometimes by the allies" (the Delawares and Iroquois). Although it is to be presumed that this is somewhat colored to conform to the interpretation of the narrator or author, there can be little doubt that the Tallegwi erected defensive structures in order to resist their enemies.

circular, when the builders must have known that the latter afforded the better chance of observing the ceremonies. Are we to assume that different enclosures were made for the different kinds of rites and games? The only reasonable conclusion, even under the supposition that these were "tabooed" or sacred places, is, that the walls were built for defence, and, as Atwood judged from his discoveries, were stockaded. But this brings up the inquiry, "Why were the sacred grounds enclosed, while the village remained without defensive walls?"

Although it is not probable that all the mystery connected with these structures will be explained away, yet the supposition that they were defensive works of people in the same culture grade as the Indians simplifies the problem, and enables us to present at least a partial explanation which is consistent with other data susceptible of interpretation.

Referring again to the Baum group shown in the figure, what is more likely than that the square enclosed the village, and the circle the maize-field? On the pyramidal mound was the council-house, within and around which the cere-

monial dances were held: and near by was the creek in which the ablutions were performed. The council-house in this case was not in the village; the latter being built near the hills, contiguous to cool springs of water, thus rendering the distance from it to the creek too great for the convenience of the bathers. The writer is aware that this explanation will not apply in full to all the enclosures of this type, as the conditions are not the same in all the localities; and it is more than likely that the customs of the villages varied to some extent, although pertaining to the same tribe. The probable differences in the age of the villages, and the modifications of customs, are also to be taken into consideration; nevertheless this supposition gives us a key that will unlock most of the mystery of these works. They are in most cases located near a stream, and consist of a square or octagon with its gateways and protecting mounds surrounding the village, and a circle enclosing the corn-field. As a rule, the small circles, which may have been places of amusement and ceremony, are outside of the large enclosures. Even at Fort Ancient, which no one doubts is a defensive work, the supposed race-track and principal mounds are outside, though the crescent, in front of which the ceremonial rites were performed, is within the fort.

[Continued on p. 372.]

NOTES AND NEWS.

SOME curious electrical phenomena were observed, according to a writer in the *Chemische Zeitung*, in a stearin and ceresin manufactory in Italy. One evening four vats of white ceresin (which is a paraffine obtained from ozokerite) containing about 500 kilograms each, were being stirred to cool. When the point of solidification was nearly reached, the electric light of the place accidentally went out; and, to the surprise and alarm of the rather ignorant workmen, the mass of ceresin was observed to give pale sparks on the slightest motion. If the hand was brought near, loud sparks nearly two inches long were obtained. The phenomenon lasted over half an hour.

— Some interesting explorations have been made in connection with the famous Adelsberg Cave. The Vienna correspondent of the London *Daily News* says that various citizens of Adelsberg, wishing to ascertain whether the Ottoker Cave, discovered a year ago at some distance from Adelsberg, was in any way connected with the great cave, followed the course of the subterranean river Poik. It was known that forty years ago a party of explorers had their progress barred by a large lake, and the present adventurers therefore carried with them a boat. Having successfully crossed the body of water mentioned, they came to lofty galleries through which the river flowed. It was possible to walk on the banks of the stream, but at intervals it expanded into small lakes, and the boat had to be used. At last the gallery branched into two corridors, one of which the stream rendered impassable, while the other was high and quite dry. The boat was dragged up, and the party proceeded. After crossing a fourth lake, the largest they had met, they found that the Ottoker Cave had been reached. The journey through the galleries lasted six hours. The explorers saw that they had by no means penetrated to the remotest parts of the grotto, and there is evidently still a wide field for discovery.

— We learn from *Engineering* of May 30 that the Chatillon-Commentry Steel Company have for some time past been experimenting with gun-tubes, projectiles, and armor-plates of steel tempered in lead. The process is simple, the steel being raised to a red heat and then plunged in a bath of molten lead, where it is allowed to cool gradually. The beneficial effects of this treatment are very marked, the elastic limit, breaking stress, and percentage elongation of the material being all increased. Actual tests of an

armor-plate thus tempered, 10.8 inches thick, which was tested at St. Jacques by firing at it with a 3.75-inch gun, showed that the penetration in the tempered plate was much less than in an untempered one. The value of this test is, however, somewhat discounted by the fact that the power of the gun was much below that required for penetrating the plate, as the striking velocity of the shell was only 1,300 feet per second, and its penetration in wrought iron would therefore be only about 4.85 inches.

— At the instance of Professor Otto Pettersson of Stockholm, a hydrographic expedition has been arranged; the professor himself and Baron Oscar Dickson finding the necessary funds, with some assistance from two Swedish marine insurance companies. The expedition, which will start from Gothenburg, comprises the salvage steamer "Skandinavien," the gunboat "Alphild," the pilot steamer "Goteborg," and the two steamers "Themis" and "Iris." Men of science will be found on board all these steamers, and samples of water and measurements of temperature will be taken. The Skagerak and the Kattegat, which are to be the places of operation, have been divided into different sections. The appliances were tested at Stockholm the other day, says *Engineering* of May 30, and gave great satisfaction. They comprise an apparatus constructed by Professor Ekman for bringing up water from a depth of up to three hundred feet, furnished with a warmth-isolator; a turbine apparatus by the same gentleman for bringing up samples of water from any depth, and fitted with one of Negretti and Zambra's deep-water thermometers; and several appliances for similar purposes constructed by Commander Arwidsson, very quick in their mode of operating, but not intended for any great depth nor for very large samples.

— Some sea-urchins are known to live in cavities in rock; and the diameter of the cavity is often wider than that of the entrance, so that the animal could not leave its home or be taken out without injury. On the French coast of Croisic (Lower Loire) may be seen thousands of urchins thus ensconced in the granite rock, which is rich in felspar and quartz. The animals, it is not doubted, make and widen the holes for themselves; but the question how has not been satisfactorily answered. Chemical solution of the rock seems excluded, considering both the nature of the latter, and also that no acid which could be thus used has been proved to exist in the urchin. The matter has been studied lately by M. John, and in an inaugural dissertation he explains the effects by mechanical action. With the so-called "lantern of Aristotle," as given in *Nature* of May 29, the animal probably bites the rock. The sucker feet are also attached, and a rotatory motion is imparted to the body; the prickly points, with the lantern, gradually wearing down the surface. These cavities afford a shelter to the urchins against the action of the waves. An attempt is made to conceal them by means of mussel and other shells. The rocks in which the cavities occur are in general thickly covered with calcareous algæ. It has been thought that possibly these decompose the rock, and so facilitate the work of the urchins. M. John, however, finds no such chemical relation; but atmospheric agencies, he considers, may help the work of boring. A number of other animals are known to penetrate rock, and it is supposed that they do it also in a mechanical way. M. Forel described to the Vaudois Society of Natural Sciences how, in the hard limestone of Constantine, Algiers, *Helix aspera* was found in holes four to five inches in depth.

— It was natural to suppose, that, as heat weakens the strength of a steel magnet, the susceptibility of a magnetic substance would increase with a fall of temperature, as also that bodies which in ordinary thermal conditions are neutral to magnetic influence, would exhibit magnetic properties if cooled down sufficiently. This point, says *Engineering* of May 2, was dwelt upon by Dr. Hopkinson in his remarkable address to the Society of Electrical Engineers, and was also made the subject of experimental demonstration by Mr. Shelford Bidwell in his recent discourse on magnetic phenomena at the Royal Institution. The substance used was an alloy of nickel and iron. Both these metals are magnetic at ordinary temperatures, but the alloy is perfectly neutral. A permanent magnet is unable to lift a strip of it; but, if cooled a few degrees below zero, the strip is at once strongly attracted by

the magnet. It is inferred that all metals would exhibit magnetic properties if cooled below this critical temperature; but of this, in the words of Dr. Hopkinson, "we have at present no indication." Mr. Bidwell also used on this occasion the very delicate apparatus which he has constructed for accurately studying the effects of a varying magnetizing force on bars of iron. He took up the subject where Joule left it in 1845, and showed that the bar lengthens at first, then contracts, becoming ultimately shorter than its original length. Joule's greatest magnetizing force was 120 C.G.S. units; Mr. Bidwell has carried his to 1000 C.G.S. units. The corresponding elongations and contractions were rendered plainly visible to a numerous audience in the usual optical way by the motion of a spot of light upon a distant screen.

—*The Engineering and Mining Journal* of June 14 is authority for the statement that small metallic articles, such as buttons, buckles, clasps, etc., have different colored films produced on them by various methods. Some of these are known as oxidized silver. Rainbow colors are produced on brass buttons by stringing them on a copper wire by the eyes, and dipping them in a bath of plumbate of soda freshly prepared by boiling litharge in caustic soda, and pouring it into a porcelain dish. A linen bag of finely pulverized litharge or hydrated oxide of lead is suspended in the solution, so as to keep up the original strength of the solution. While the buttons are in this solution, they are touched one after the other with a platinum wire connected with the positive pole of a battery until the desired color appears. The galvanic current employed must not be too strong. The colors are more brilliant if they are heated after they have been rinsed and dried. Colored films are more conveniently produced upon bright brass by different chemicals, by painting with them, or by immersion. For example: golden yellow is obtained by dipping in a perfectly neutral solution of acetate of copper; dull grayish green, by repeatedly painting with very dilute solution of chloride of copper; purple, by heating hot, and rubbing over with a tuft of cotton saturated with chloride of antimony; golden red, by covering with a paste of four parts of prepared chalk and of mosaic gold. In covering an article with any colored bronze in powder, it is first rubbed with a very little linseed-oil, and the bronze dusted evenly over it from a dust-bag. It is afterward heated in an iron pan to about 480° F. In recent times, small articles are also roughened by dipping in strong nitric acid; and, after washing and drying, they are coated with a rapidly drying alcohol varnish that has been colored yellow with picric acid, red with fuchsine, purple with methyl violet, or dark blue with an aniline blue. This gives the desired color with a beautiful metallic lustre. The latter colors are not very durable, and are for inferior goods.

—The report of Arthur W. Winslow, State geologist of Missouri, states that the detailed mapping of the coal-fields has progressed with little interruption. Field-work has now been extended over nearly four hundred square miles, and the results have been plotted on the preliminary sheets, and are now being transferred to the final sheets. On May 3, Mr. Gilbert Van Ingen reported at the office of the Missouri Geological Survey. He is detailed by the United States Geological Survey to assist in paleontologic work in Missouri. He has been at work during the greater part of April in Pettis County. Detailed mapping was prosecuted during the early part of the month in south-eastern Missouri, and about seventy square miles have been covered. Work on the building-materials and clays of St. Louis was vigorously pushed during the latter half of April. Along with a study of the origin and distribution of the clay deposits and of the economically important limestones, inquiry has been made into the nature and extent of the dependent industries. About two-thirds of the stone-quarries have been visited, and nearly all of the clay-works. An idea of the magnitude of the interests involved may be gathered from the following approximate statement of the number of works in and about St. Louis: eight fire-brick and sewer-pipe manufactories, forty common and pressed brick manufactories, six potteries, one terra-cotta manufactory, two terra-cotta lumber manufactories, forty stone-quarries. The value of the annual output of the clay industries is at present in the vicinity of three million dollars, and that of the stone-quarries cannot

fall far short of one million. In the laboratory nearly all of the samples of mineral waters collected during April have been analyzed, and the results will soon be ready for publication. In addition, some seventeen lots of specimens sent in by outside parties have been identified and reported upon, and a few analyses of coals and iron ores for survey purposes have been made. Preliminary inspections have been made in Platte, Clinton, Crawford, and Morgan Counties. In Platte and Clinton Counties are coal-beds of economic value, but their mineral waters and clays also deserve attention. There is every probability that the 22-inch coal-bed mined at different points in the vicinity of Leavenworth, Kan., as well as others found at different depths, extends under these counties. Its depth below the surface at Leavenworth is about seven hundred feet, but eastward into Missouri it must rise progressively towards the surface. The exact determination of these points, as well as the definition of the limits of the bed, cannot be made until systematic and detailed work is done in these counties. In view of the extensive development of the coal industry at Leavenworth close to the Missouri line, and in view of the probable establishment in the future of a similar industry in Missouri near the Kansas line, provisions should be made in the near future whereby encroachment of mining operations from a property in one State upon a property in the other State shall be prevented. In Crawford County iron ore still occupies a prominent place among its mineral products. Some of the deposits of this ore are, however, exhausted, and others are approaching that condition. The demand will before very long be urgent for new sources of supply. The conditions are such, in this and adjoining counties, as to justify the expectation that systematic and thorough geologic work may lead to the discovery of other deposits; and it is the intention to institute such work as soon as the means and the demands upon the force of the survey will permit. Operations looking to the development of zinc and lead mining are also in progress. In Morgan County there are prospects of a revival in lead-mining, and this in a more thorough manner than has been the case in past years. A profitable industry may be built up there if the developments are made cautiously and under competent direction, such as will lead to a knowledge of the origin of the ore, and such as will guide one in selecting localities for prospecting. The survey is not at present in a position to give specific advice on such matters, however, and cannot do so until detailed local work is finished. Zinc-mining is also being started in Morgan County, notably at the "Big Three Shaft," about five miles south-west of Versailles.

—A petition was lately presented to the Medical Assembly of the Grand Duchy of Baden by the German Women's Association of Leipzig, praying that women might be admitted to study medicine. The assembly passed a resolution declining to take any step in the matter, on the ground that women are unfit for the learned professions, and especially for that of medicine, and, moreover, that the latter is already overcrowded. Herr Arnsberger, the ministerial councillor representing the government, said the question was not yet ripe for solution. He also pointed out that the matter was one for the decision of the imperial authorities, not for that of the individual states. A similar petition has recently been presented by the same association to the Weimar Landtag, in which the ladies ask to be admitted to the University of Jena, not only to study medicine, but with the view of qualifying for appointment as scientific teachers.

—Duffield Osborne, author of "The Spell of Ashtaroth," has written an article on surf-bathing for the *July Scribner*, which will contain practical directions and sketches showing how to avoid the dangers of the surf, and how to get the most pleasure out of it.

—Messrs. John Wiley & Sons announce as in preparation "Mechanics of the Machinery of Transmission," being Vol. III., Part I., Section II., of "Mechanics of Engineering and Machinery," by Dr. Julius Weisbach, edited by Professor Gustav Hermann, and translated by Professor J. F. Klem, Lehigh University, Bethlehem, Penn.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada..... \$3.50 a year.

Great Britain and Europe..... 4.50 a year.

Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

VOL. XV.

NEW YORK, JUNE 20, 1890.

No. 385.

CONTENTS:

THE CHEROKEES IN PRE-COLUMBIAN TIMES. <i>Cyrus Thomas</i> ...	365	On the Determination of Parallax by the Spectroscope.	
NOTES AND NEWS.....	370		
THE ROYAL SOCIETY OF CANADA..	373		<i>A. D. Risteen</i> 375
HEALTH MATTERS.		Temperature in Storms.	
Sterilizing Water.....	374		<i>M. A. Veeder</i> 376
Coffee Inebriety	374		
LETTERS TO THE EDITOR.		BOOK-REVIEWS.	
Dr. Hann's Studies on Cyclones and Anticyclones.		The Criminal.....	376
	<i>Franz A. Velschow</i> 374	AMONG THE PUBLISHERS.....	377

THE CHEROKEES IN PRE-COLUMBIAN TIMES.

IV.

[Continued from p. 370.]

In some cases, as at the Liberty Township Works ("Ancient Monuments," Plate XX.), a special arrangement seems to have been made for this purpose. Here we see a connected third circle, much smaller than the other two, in which is a crescent and mound; there is, however, a little exterior circle. We notice here that the square or village site is near the bluff from whence springs issue.

The square of the Seip Works ("Ancient Monuments," No. 2, Plate XXI.) and of that figured in No. 3 (same plate) are next the stream, as there were no springs in reach.

The complicated group at Newark, of course, presents features difficult to explain; but it is apparent that there were two villages, probably established at different times, but both occupied from the time the latter was built until the whole was abandoned. The octagon is near the creek, but its position was doubtless selected on account of the spring near its northern corner. The southern circle, *E*, was possibly a place devoted chiefly to ceremonies and games. One line of parallels seems to have been a passage-

way from one village to another. It is apparent from their courses and the topographical features of the area that none of these guarded ways were intended for race-tracks. That the small, circular enclosure *F*, known as the "Observatory Circle," was not sufficient in extent to supply the villages with bread, is admitted: hence it was necessary to assume that there were unenclosed fields, probably on the land north of the group, between the parallels running east and west, and in the area east of the pond. It is possible that the space between the two lines of parallels, running east and west, was partially occupied by dwellings, especially that portion on the upper, level land. These suggestions are of course largely speculative; nevertheless, if there be any truth in the tradition of the Tallegwi, it is probable that here they made their first determined stand after defeat in open battle. The people of other villages, not enclosed, probably fled thither, and joined in erecting fortifications and defensive walls. Be this as it may, it is apparent that they belong to the same type as those in the Scioto and Paint Creek valleys, and may be ascribed to the people who built the latter. That they were defensive seems to be established by the considerations presented, and others which might be urged did space allow us to offer them. It is apparent to any one not biased by a preconceived theory, who will study these works carefully, that their characteristics are essentially aboriginal: in other words, there is nothing in their form or construction contradictory to the theory of their Indian origin, except it be the single fact that a few of them approach very nearly to true geometrical figures. That it was a custom among the Indians north and south to build circular enclosures and forts, is fully attested by the historical records; it is also known that some of the Indian forts in the northern section were polygonal, especially those built by the Iroquois tribes. Numerous instances can be cited where villages were surrounded by fortifications in both these forms.

The suggestion that the circles adjoining squares were built around maize-fields is not original with the writer, as it had already been presented by Lewis H. Morgan, in his "Houses and House Life of the American Aborigines." He remarks, that "with respect to the large circular enclosures, adjacent to and communicating with the squares, it is not necessary that we should know their object. The one attached to the High Bank Pueblo contains twenty acres of land, and doubtless subserved some useful purpose in their plan of life. The first suggestion which presents itself is, that as a substitute for a fence it surrounded the garden of the village in which they cultivated their maize, beans, squashes, and tobacco. At the Minnitaree village a similar enclosure may now be seen by the side of the village, surrounding their cultivated land, consisting partly of hedge and partly of stakes." Whether these dirt walls were mere supports to stockades is a question not yet settled; nevertheless it is probable they were surmounted by stakes, or supported a wooden fence or screen of some kind. The fact that the ditch is here usually on the inside cuts but little figure in the discussion, as we find this to be the case in many works which are undoubtedly of a defensive character, as Fort Ancient, and the circular enclosure in Iowa shown in Plate II., "Fifth Annual Report of the Bureau of Ethnology." In fact, this was consistent with the Indian mode

of warfare. Long tells us, in the account of his expedition, that sometimes they would hastily dig a trench, throwing the dirt on the danger side, and thus form a defensive barrier.

Whether the hill-forts are to be attributed to the authors of the circles and squares is doubtful: in fact, the indications appear to lead to the opposite conclusion. Certainly there is no reason for supposing that Fort Ancient, Fortified Hill, and other works of this character in the Miami valleys, were built by this people. The writer is inclined to the belief that they are the work of the Shawnees, but cannot undertake at this time to give his reasons for this opinion.

As the so called "altars" form a link in this historic chain, we may as well remark here that the names "sacrificial mounds" and "altars," implying human sacrifice, have been brought into use without even the shadow of evidence therefor. As Morgan has truly observed, "there is no propriety in the use of either of these terms, or in the conclusions they would force us to adopt. . . . These clay beds were not adapted to the barbarous work." Possibly they may have been places where prisoners were burned, which was the chief sacrifice offered by Indians. The basin-shaped clay beds of the Kanawha and East Tennessee mounds seem to have grown out of them, and their uses were probably similar.

CYRUS THOMAS.

[To be continued.]

THE ROYAL SOCIETY OF CANADA.

THE eighth annual meeting of the Royal Society of Canada is just over; and, from the interest manifest in the four sections into which that society is divided, no better proof of the growth, usefulness, and success of such an organization can be desired.

Of forty-three papers which were presented, either read *in extenso*, in abstract, or by title, no less than twenty of them treated on scientific topics, while the remainder were devoted to historical, political, and literary subjects.

Sections III. and IV. of the Royal Society are specially devoted to the sciences: the former embracing the mathematical, physical, and chemical sciences; the latter, the geological and biological sciences. A list of the papers read in these sections was published in *Science* of June 6.

The character of the papers read in the section of the geological and biological sciences were all of a high order, and interesting discussions took place. Dr. G. M. Dawson, assistant director of the Geological Survey, was president, and for his inaugural delivered an address upon the "Mesozoic and Tertiary History of the Rocky Mountain Region of Canada," in which the geological history of the Cordillera is traced from the triassic period to the close of the tertiary, and special reference is made to the process of development of the surface features of the region, together with the changes in elevation of the land at different periods. Another paper by Dr. Dawson, which can be regarded as a supplement to the foregoing, gave a very succinct sketch of the glacial history of the Rocky Mountain region of Canada, bringing the subject-matter to date. These two papers were followed by another from the pen of Principal Sir William Dawson, on "Fossil Plants from the Similkameen River and other Places in the Southern Interior of British Columbia." The following is an abstract of this paper:—

The deposits affording these plants have been described by Dr. G. H. Dawson in the "Report of Progress of the Geological Survey of Canada for 1877-78" (pp. 130B, 166B). They are of lacustrine origin, and underlie basalt and other volcanic materials. The beds holding well-preserved remains of plants are chiefly those composed of fine laminated clayey or silty material, which in some cases has been hardened by silicious matter which appears to have been derived from springs contemporaneous, or nearly so,

with the date of formation of the beds. These deposits have been approximately assigned to the period of the miocene tertiary. They contain a number of species of fossil insects which have been described by Scudder (report above cited, p. 175B), and fossil plants, of which a provisional list was given in the same report (pp. 186B-187B). The present paper relates to additional collections of plants from the Tulameen or North Fork of the Similkameen, Tranquille River, etc., and which, while they extend our knowledge of the flora, tend strongly to confirm the miocene age of the formation, and to connect it with similar deposits farther north in Alaska.

The object of the paper, "Stratigraphical Notes on the Citadel Hill, Quebec" (in French), by L'Abbé Laflamme, was to determine the structure of the beds constituting the cliff at the citadel near the Dufferin Terrace, Quebec, where the "land-slide" occurred in September, 1889, and thereby to ascertain the cause of the disaster. Professor Laflamme pointed to imminent danger even at present, and the probable sliding-away of several feet of strata, which sooner or later must take place. A very interesting and animated discussion followed.

The paper on "Illustrations of the Fauna of the St. John Group, No. V.," by G. F. Matthew, M. A., was a continuation of the paper of last year which described the fossils of the "Basal Series" (beneath the St. John group), and the new ones of Band C of Division 1 of the St. John group. The following points were discussed in this paper: (a) a description of the structure of the St. John basin, (b) a description of the new series in Division 1 of the St. John group and of newly recovered parts of others, (c) a description of the tracks and organisms of Division 2, and (d) a description of the fossils of Division 3. Peculiar tracks have been detected, which appear to be those of radiate animals. A good many tracks have been observed in the sandstones and shales of Division 2, which are like those of the Eophyton sandstone in Sweden; but it is thought that this resemblance is due to a similarity of conditions under which the above sandstones and those of Division 2 were deposited, as the *Paradoxides* fauna undoubtedly intervenes.

Mr. E. Gilpin, commissioner of mines for Nova Scotia, in his paper on "The Evidence of a Nova Scotia Carboniferous Conglomerate," referred to the nature, source, and extent of the modern drift of Nova Scotia, and to the shingle beaches formed from it. He described the carboniferous conglomerates of Cape Breton as consisting usually of detritus derived from local sources, and in Nova Scotia proper cited the conglomerates of the south side of the Cobequids, and of New Glasgow, as good examples of conglomerates formed from subjacent strata. The auriferous conglomerates of Gays River, Colchester County, were described, and the occurrence in it of boulders referable to pre-carboniferous measures lying to the north was noticed. The inference suggested was that the modern drift-transporting agency, carrying to the Atlantic shore boulders referable to the Cobequids, was paralleled, at the opening of the carboniferous period, by a similar agency furnishing boulders found in lower carboniferous conglomerates at Gays River.

The paper on "Southern Invertebrates of the Shores of Acadia," by W. F. Ganong, was submitted to the Royal Society, and read by Professor L. W. Bailey of New Brunswick University. It opened with a sketch of the progress of knowledge of the distribution of marine invertebrate animals on the east coast of North America, from the time of the establishment of Milne-Edwards's "Pennsylvanian Region" in 1838, down to its division into the Syrtusian, Acadian, Virginian, and Carolinian faunæ, as accepted by students to-day. Attention was then called to the well-known occurrence of southern or Virginian forms in the Gulf of St. Lawrence, at Sable Island, and at other points on the coasts of Acadia and Maine; and a table was given showing the twenty-five undoubtedly southern species of mollusca. At least three *Echinodermata* occupy these localities, mingled with the more northern forms. This anomalous condition cannot date far back, since post-pliocene deposits show no trace of it. Indeed, there is evidence to show that changes are still going on; and facts drawn from Indian shell-heaps, from dead beach and dead dredged shells, and from old books, all show that these southern forms had for-

merly a wider range than now, and that they are gradually disappearing. The physiography of the coast of Acadia was then discussed, the distribution of currents considered, and evidence given to show that the land in all this region is steadily sinking. The effect of this depression on the currents of this coast was discussed, and the views of Verrill and Dawson considered. The conclusion was arrived at, that the known facts as to currents, the sinking of the land, etc., explained the phenomena under discussion. The relation of these facts to post-pliocene conditions was referred to, and a sketch given of what remains to be done in this field.

At the closing meeting of the society, the following officers were elected for the ensuing year in the Geological Section: viz., president, Professor W. Saunders, director of the Central Experimental Farms, etc.; vice-president, Professor L'Abbé Laflamme; secretary, Mr. J. F. Whiteaves. For the whole society, Very Rev. Principal George Munro Grant of Queen's University, Kingston, was elected president, and Rev. L'Abbé Laflamme of Laval University, vice-president. The honorary secretary is Dr. J. E. Bourinot.

HEALTH MATTERS.

Sterilizing Water.

In a paper published in the *Medical Record* of June 14, 1890, Dr. C. G. Currier of New York states that unless extraordinarily resistant, water becomes sterilized if it be at or near the boiling temperature for fifteen minutes. If the same degree of heat be maintained for five minutes, all harmful micro-organisms will have been destroyed. Still less time serves to destroy the disease-producing varieties which are recognized as liable to occur in water. Thus merely raising to the boiling-point a clear water containing the micro-organisms of malarial disorders, typhoid, cholera, diphtheria, or of suppurative processes, and allowing it to gradually cool, insures the destruction of these germs. They are also destroyed by keeping the water for from a quarter of an hour to half an hour at a temperature of 70° C.

Occasionally, however, very resistant but harmless bacteria may get into water. The brief heating renders them safe for drinking-purposes; but, when it is desired to destroy every micro-organism that may be present in a contaminated water, it should be heated for one hour, and allowed to cool slowly. Then it may be used for cleansing wounds or for alkaloidal solutions, which will keep indefinitely if no germs be introduced after the solution has been heated.

Coffee Inebriety.

Dr. Mendel of Berlin has lately published a clinical study of this neurosis, his observations being made upon the women of the working population in and about Essen. He found large numbers of women who consumed over a pound of coffee in a week; and some men drank considerably more, besides beer and wine. The leading symptoms were profound depression of spirits, and frequent headaches, with insomnia. A strong dose of coffee would relieve this for a time, then it would return. The muscles would become weak and trembling, and the hands would tremble when at rest. An increasing aversion to labor and any steady work was noticeable. The heart's action was rapid and irregular, and palpitations and a heavy feeling in the præcordial region were present. Dyspepsia of an extreme nervous type was also present. Acute rosacea was common in these cases. These symptoms constantly grow worse, and are only relieved by large quantities of coffee, generally of the infusion. In some cases the tincture was used. The victims suffer so seriously that they dare not abandon it, for fear of death. Where brandy is taken, only temporary relief follows. The face becomes sallow, and the hands and feet cold; and an expression of dread and agony settles over the countenance, only relieved by using strong doses of coffee. In all these cases, acute inflammations are likely to appear any time. An injury of any part of the body is the starting-point for inflammations of an erysipelatous character. Melancholy and hysteria are present in all cases. Coffee inebriates are more common among the neurasthenics, and are more concealed because the effects of excessive doses of coffee are obscure and largely un-

known. Many opium and alcoholic cases have an early history of excessive use of coffee, and are always more degenerate and difficult to treat. A very wide field for future study opens up in this direction.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Dr. Hann's Studies on Cyclones and Anticyclones.

IN your issue for May 30 I have with much interest noticed a letter by "W. M. D.," entitled "Dr. Hann's Studies on Cyclones and Anticyclones." It contains a passage which I am unable to comprehend; and, with your permission, I should like to ask the writer, through your columns, to enlighten me on the subject.

Mr. D. declares himself an advocate of the convectional theory of cyclones, and states, "There is unquestionably an ascending component of motion in cyclonic areas, and a descending component in anticyclones." This is what I do not understand. The question is apparently that of a body of air moving in a certain direction, but in what direction it is moving I don't quite see; and neither do I understand what is meant by a "component of a motion."

To put my question more precisely, I noticed once, in a book called "Weather," by the Hon. Mr. Abercrombie, that the author had observed that the waves on the North Sea differ in shape, when caused by a north-east wind under high pressure, from that when caused by a south-west wind with low barometer; and he considered this a proof that the air in an anticyclone is a descending current, and the air in a cyclone an ascending current, of air.

As an engineer, I am in the habit of always making a diagram on paper whenever I have a mechanical or dynamical problem before me; and it is a safe rule in applied mechanics that whatever cannot be thus represented does not exist. But in this case I came to the result that a supposed descending current of air in an anticyclone, having once reached the surface of the sea, must needs afterwards follow this surface,—that is, blow horizontally, or come to a standstill,—and also that a supposed ascending current must instantly, the moment it starts, come out of contact with the surface of the sea, and henceforward be unable to materially affect the shape of the waves. In other words, a body of air moving over the surface of the sea must necessarily have a horizontal direction; and the only cause I can imagine of the supposed difference in the shape of the waves is the difference in friction between air and water surface when the air-pressure is high or low.

I therefore beg to ask Mr. D. to give me some kind of a graphical representation showing the direction of the motion of the air in cyclones and anticyclones; say, for example, in the North Atlantic anticyclone at horse latitudes; and if he is unable to do so, he will allow me to believe that his statement is far from being unquestionable.

Mr. D. further states, "The convectional theory is merely a local application of a theory that is universally accepted to account for the general circulation of the atmosphere between equator and poles." But is it, after all, necessary to account for such a circulation? Has there ever been found the faintest actual proof to show that such a general circulation really takes place?

As to the other parts of Mr. D.'s letter, he will excuse me for saying that I cannot share his apprehension that Dr. Hann's studies will much alter the views held on cyclones and anticyclones, as the doctor's observations merely deal with temperatures at the earth's surface, which, as is well known, are local, and perfectly independent of the temperatures of the air at some considerable distance from the surface; which latter, however important in this kind of investigations, are unattainable unless by balloon ascents. A body of surface air moving over the ground must necessarily follow the shape of this latter; and consequently the air which is to-day at the summit of the Alps was yesterday

at the bottom of the Rhone valley, and will to morrow be sweeping over the Rhine, or *vice versa*, according to the direction in which the surface wind blows. Hence Dr. Hann's observations, however valuable otherwise, can have only small bearing on the question of the cause of cyclones and anticyclones.

FRANZ A. VELSCHOW, C.E.

Jones Point, N.Y., June 2.

On the Determination of Parallax by the Spectroscope.

IN the winter of 1883-84 it occurred to the writer that the spectroscope might be made use of in the determination of the parallaxes of certain double stars. As there were no data at hand that would allow a numerical example to be worked out, the method was not published at the time, but was withheld until such data should be available. Recently my attention was drawn to the systematic measures carried on at Greenwich since 1876; and, although these are very unsatisfactory on account of their large probable error, it may be of interest to apply them to an actual parallax determination.

The method about to be proposed is based upon the well known fact that the positions of the lines in a star's spectrum depend not only upon the substances to which these lines are due, but also upon the velocity of the star's motion in the direction of the line of sight. So far as the writer can see, it is applicable only to double stars; and it may be made use of in two different forms, the first of which is applicable when both components of the star are bright enough to be observed spectroscopically, and the second when only one component is bright enough to be so observed.

In the first case, both components being bright, let S be the one to which the orbit is referred, and let C be the companion; ω is the angle that the tangent at C makes with CS , and θ the angle that it makes with the line of sight. V_0 is the velocity with which S is receding from the earth at a given moment, and V_1 is the velocity with which C is receding at the same moment, both being expressed in miles per second. The orbital velocity of C at this moment we will call v , the unit of length being that length which subtends an angle of one second at the star's distance from the earth. If π is the parallax of the star (supposed unknown), and D is the radius of the earth's orbit, v can be expressed in miles per second by multiplying it by $\frac{D}{\pi}$. Expressing it in this manner, we have

$$(V_0 - V_1) = v \cdot \frac{D}{\pi} \cdot \cos \theta \quad (1)$$

But

$$v = \frac{2A}{p r \sin \omega} \quad (2)$$

where p is the period of the star in seconds of time, r is the radius vector of the component in seconds of arc, and A is the area of the orbit, the unit of length being the same as in the case of v . Substitution in (1) gives us

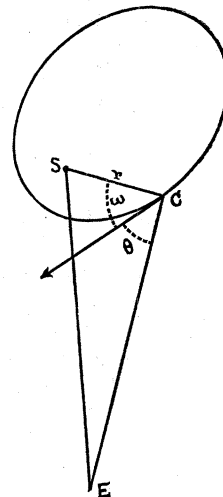
$$(V_0 - V_1) = \frac{2AD \cos \theta}{p r \sin \omega} \cdot \frac{1}{\pi} \quad (3)$$

The first member of this equation is to be observed by the spectroscope, and the co-efficient of the second member is to be computed from the elements of the star's orbit. The only quantity remaining is the parallax of the star, which is found by simple division. If it is desired to make a number of observations at different times, and combine the whole by the method of least squares, the normal equation will be, of course, $[a^2]x = [al]$, equation (3) being now of the form $ax = l$.

Undoubtedly the best way to determine the absolute term in equation (3) is to photograph the spectra of both stars on the same plate, and measure the intervals between the corresponding lines in the two. The probable error of a determination so made will be less than if V_0 and V_1 were measured separately and their difference taken. I do not find that this has been done in the case of any star whose orbit is known; but that the lines in the spectrum of a double star can be so photographed and measured, at least in certain cases, is well shown by Professor Pickering's recent work on *Beta Aurigæ* and *Zeta Ursæ Majoris*, which stars were not known to be double until the spectroscope showed them to be so. It is true that the proximity of the components of these

stars, and their consequent short periods, make the measurement particularly easy in these cases; yet I trust that it is not unreasonable to hope that measures may be made on other stars sufficiently good to afford us some idea of their parallax.

When one of the components of a double star is so faint that its spectrum cannot be observed, it becomes necessary to modify the foregoing mode of procedure somewhat. Let S be the principal star, as before, and C the companion. Let V be the velocity of recession of the principal star, and V_0 the velocity of recession of the centre of gravity of the system (V_0 being appreciably constant for many centuries). Let a be the semi-axis major of the orbit of the companion, when referred to the principal star, and let a_1 be the semi-axis major of the smaller ellipse described on the heavens by the larger star, in consequence of its having a companion (this



may be determined by comparing the position of the principal star with smaller stars in the vicinity, not physically connected with it). Then we have the equation

$$V = V_0 + \frac{a_1}{a} \cdot \frac{D}{\pi} \cdot v \cdot \cos \theta \quad (4)$$

(this is obtained by resolving the velocity of the component along the line of sight, multiplying the result by a_1/a to find the corresponding differential velocity of the principal star, and adding to the velocity of the centre of gravity of the system). Substituting in (4) the value of v as given in (2), we have

$$V = V_0 + \frac{a_1}{a} \cdot \frac{2AD \cos \theta}{p r \sin \omega} \cdot \frac{1}{\pi} \quad (5)$$

This is the form of the observation equation. V is observed, at intervals, by the spectroscope, and corresponding values of the co-efficient of $\frac{1}{\pi}$ are computed. The normal equations are, then,

$$[pV] = [p]V_0 + [pF]x,$$

$$[pFV] = [pF]V_0 + [pF^2]x,$$

(5) being of the form $V = V_0 + Fx$.

As already intimated, the writer has applied this method to a particular case, using the spectrum observations made at Greenwich since 1876, together with one measure obtained by Huggins in 1868. Sirius was selected for the purpose for several reasons. Its orbit is fairly well known, the spectrum observations on it cover an interval of twenty years, the period of the star is short, and various determinations of its parallax have already been made by the direct method. The elements of the star, according to Mr. J. E. Gore (*Monthly Notices of the Royal Astronomical Society* for June, 1889), are as follows:—

$T = 1896.47$	$\Omega = 49^\circ 59' (1880.0)$
$P = 58.47$	$i = 55^\circ 23'$
$a = 8''.58$	$\gamma = 216^\circ 18'$
$e = 0.4055$	$\mu = -6''.157$

It appears also, from Auwers's work, that the semi-axis major of the orbit that the principal star describes about the centre of

gravity of the system is $\alpha_1 = 2''.33$. Computing the co-efficients of $\frac{1}{\pi}$ for the thirteen years for which I have spectroscopic results, the following observation equations are obtained:—

No.	EQUATION.	DATE.
(1)	$V_0 - 0.342 \frac{1}{\pi} = +29$	1868.1
(2)	$.447 = +24$	1876.11
(3)	$.453 = +12$	1877.16
(4)	$.456 = +24$	1878.16
(5)	$.455 = +16$	1880.18
(6)	$.450 = +12$	1881.14
(7)	$.440 = +16$	1882.21
(8)	$.426 = -5$	1883.17
(9)	$.408 = -20$	1884.11
(10)	$.384 = -23$	1885.09
(11)	$.354 = -24$	1886.00
(12)	$.311 = +4$	1887.05
(13)	$.271 = +35$	1887.82

Giving the weight unity to each of these, the following normal equations result:—

$$13 V_0 - 5.2 \frac{1}{\pi} = +100$$

$$-5.2 V_0 + 2.124 \frac{1}{\pi} = -39.86$$

Hence $\pi = 0''.34$.

The only direct determinations of the parallax of Sirius that I have at hand are those of Henderson and Peters ($0''.150$), Gyldeén ($0''.193$), and Gill and Elkin ($0''.39$). The agreement between this last result and the one deduced above by the spectroscopic method is of course purely accidental, the Greenwich measures being too rough to furnish us with a result even passably good. It is to be hoped that measures may be made, with improved apparatus, that will enable us, in the course of time, to apply the spectroscopic method to a large number of double stars. Dr. Vogel's photographic measures, taken at Potsdam, are far superior to any thing else the writer has seen in this line, unless the Harvard College measures are excepted. They have a very small probable error, and the measures on Venus seem to indicate that his work is not materially affected by constant errors. As a matter of fact, constant errors are of no importance in deducing parallax by the spectroscope, since they affect V_0 only, and not π .

It is plain that the method set forth in this article is open to many objections. It is beset with difficulties, but it should not be discarded or lost sight of for that reason. The fact is, that we must either forever give up the effort to determine the distances to the more remote stars, or we must seek them by this method. Very few stars are near enough for us to measure their parallaxes directly; but the spectroscopic method is still applicable when there is no indication of parallax to the micrometer. The velocity of motion in the line of sight may be measured with equal ease, whether the star is near or remote; and the only limit to the power of the method lies in the increasing closeness of the double star as the distance grows greater, and the corresponding difficulty of determining the orbits. By photographing binary systems at intervals of a few years, and measuring distances and position angles on the negative, much better orbits might be computed than we have at present.

While at work on the numerical example in this article, I have endeavored to find out whether others have not worked at this same problem. My attention has been called to several papers that apparently relate to it, though I have been unable to gain access to more than two of them, and then only for a moment, so that I could give them only a hasty examination. The first paper that I find reference to was by C. Dufour, the title being "Utilisation de l'analyse spectrale pour déterminer la distance de certaines étoiles doubles" (Lausanne, Bulletin des séances de la Société vaudoise des sciences naturelles, vol. xiii., 1874, p. 452). The second paper, by Edward C. Pickering, is entitled "Dimensions of the Fixed Stars, with Especial Reference to Binaries and Variables of the Algol Type," and is in the "Proceedings of the American Academy of Arts and Sciences," 1880, vol. xvi. This

paper, as its title indicates, relates more particularly to the dimensions of stellar systems than to their parallaxes. The third paper was read before the Royal Irish Academy on May 24, 1886, by Arthur A. Rambaut, the title being "On the Possibility of determining the Distance of a Double Star by Measures of the Relative Velocities of the Components in the Line of Sight." The method here proposed is not applicable unless both components are bright enough to be observed spectroscopically. It appears to be identical with what I have called the "first method." Finally, Herr J. Palisa published an article on the subject while the present one was in preparation, entitled "Ueber die Bestimmung der Parallaxe von Doppelsternen" (*Astr. Nach.*, No. 2,941, Dec. 12, 1889). I have not seen this paper, but I understand that in it he refers to a dissertation by one Hans Homann, the title of which is "Beiträge zur Untersuchung der Sternbewegung," which presumably touches upon the same subject. A. D. RISTEEN.

Hartford, Conn., June 13.

Temperature in Storms.

In the "Smithsonian Report for 1865," beginning at p. 340, there is a detailed account of a balloon ascension at Paris on July 27, 1850, during a severe storm of rain with some strong wind gusts. The most interesting point is the severity of the cold encountered, the temperature falling to -39° C. at an elevation of seven thousand metres. It is stated that at the beginning of the ascent "a deluge of rain was falling," which shows that it must have been made near the centre of precipitation, if not at the exact storm-centre. It would seem that these observations are confirmatory of those noted by Dr. Hann, to which reference is made by Professor Davis in *Science* for May 30.

M. A. VEEDER.

Lyons, N. Y., June 9.

BOOK-REVIEWS.

The Criminal. By HAVELOCK ELLIS. London, Walter Scott; New York, Scribner & Welford. 12°. \$1.25.

MR. ELLIS, the editor of this promising series of scientific monographs, has contributed to it in this volume a well-planned and ably executed *résumé* of modern criminology. So little of this science has hitherto been accessible in English, that this compilation is especially timely. It is an outcome of a pedantic and unscientific view of crime, that we are obliged to speak and accustomed to think of all persons liable to punishment as criminals. There are certain very well marked distinctions between classes of criminals, that should be generally recognized. There is the criminal by passion, the insane criminal, the occasional criminal, the instinctive criminal, the habitual criminal, the professional criminal. While the existence of some of these is rather the crime of the society that breeds them, others are distinctly diseased forms of humanity, which we must study in order to understand and to treat. It is the biological, sociological, and psychological study of the criminal classes, so vigorously pursued in Italy and other countries of Europe, that is described in the present volume. On the physical side, the shape of the cranium, the tendency to asymmetry, the peculiarities of face, the details of the ear, nose, and so on, anomalies of the hair and pigmentation, hereditary characteristics, motor inertia and sensory insensibility, fondness for tattooing, and the like,—these characteristics have been made the subjects of special monographs, and in many cases class distinctions between the criminal and his more normal fellow-being have been successfully laid down. While it is not yet possible to describe accurately and briefly the results of these methods of study, and still less so to apply them to individual cases, enough has been done to indicate that all kinds of abnormalities are more common among criminals than among normal people, and to give interesting glimpses into the nature of these differences. These physical differences are connected with and lead up to moral and intellectual differences, and the studies of the two have advanced together. The moral obtuseness, the lack of sympathy, the selfish and thoughtless satisfaction of sudden and strong impulses, the keen cleverness in certain limited directions but general stupidity in every thing else, the emotional

instability, the peculiar combination of a kind of sentimentality with apathy,—these characteristics seem to mark the criminal in all countries; and interesting illustrations of these are to be found in Mr. Ellis's book. Apart from the interest in the facts themselves, this study is important for the analysis of the factors that cause crime. Is it biological, an atavistic reversal to outgrown habits? Is it purely the anti-social instincts coming to the front? Would not the hero of former days be regarded as a criminal to-day? Such are the questions that arise when we pass from description to analysis. In this discussion the many points of analogy between the criminal and the savage deserve especial attention. The mental and moral habits present many points of identity, and lead to the perpetuation of many customs, such as the love of tattooing, the sudden breaking-out of excessive emotions, the indulgence in orgies, and the like. There thus seems to be marked out a class of recidivists, or backsliders, who are unable to keep up with the complex requirements of modern life, and fall back into the habits of less civilized conditions.

The practical bearing of this study is unmistakable. The common prison system, with the sentence meted out for the crime and not for the criminal, is evidently unsuited to the needs of the criminal classes. If the object is to restore these unfortunates as far as possible to places in a social community, the treatment of criminals must be a far different one from that now in vogue. This sentiment is becoming more and more widely appreciated, and some important reforms have already been put into practice. Of these, the reformatory at Elmira is the most noteworthy, and receives the place of honor in Mr. Ellis's chapter. Here, under the indeterminate sentence law, a prisoner works out his own release, and is prepared, by a carefully planned system of physical, mental, and moral training, to fit himself for citizenship. The whole man is considered, and the ideal is as different from the notion of

punishment for the crime as it well can be. And this system is avowedly based upon the anthropological and psychological analysis of the criminal character. Practice necessarily hobbles along after theory, but it is certainly high time that the discrepancy between scientific knowledge and legal practice be reduced.

In addition to the aspects of the criminal here lightly touched upon, Mr. Ellis gives very interesting illustrations of less typical points, such as their peculiar slang, their literary productions, prison inscriptions, prisoners' views of life and religion, and the statement of the case from the criminal's point of view. The volume thus fills a real need, and may be recommended to all who have an interest in one or other of the many aspects of this important study.

AMONG THE PUBLISHERS.

THE Religious Tract Society, London, announce for immediate publication through their American agent, Mr. Fleming H. Revell of New York and Chicago, the following: "London Pictures," being the last addition to the popular Pen and Pencil Series; a new book by Sir J. William Dawson, entitled "Modern Ideas of Evolution as related to Revelation and Science;" "Home Handicrafts," by Charles Peters, editor of "The Girls' Own Indoor Book," etc.; and "Stanley's African Expeditions."

—The first number of the *Annals of the American Academy of Social and Political Science*, a new review of politics and economics, will shortly appear in Philadelphia. It will contain, among other articles, one on "Politics in Canada and the United States," by Dr. Bourinot; another on "Decay of Local Government in America," by Professor Patten; and a third on "Cheaper Railroad-Fares," by J. J. Wetherell. The *Annals* is the organ of

Publications received at Editor's Office, June 9-14.

- ABEL, W. J. School Hygiene. London and New York, Longmans, Green, & Co. 53 p. 12°. 30 cents.
- BEARD, W. S. Longmans' Junior School Algebra. New York and London, Longmans, Green, & Co. 220 p. 12°. 60 cents.
- CHISHOLM, G. G. A Smaller Commercial Geography. London and New York, Longmans, Green, & Co. 208 p. 12°. 90 cents.
- CONNECTICUT State Board of Health, Twelfth Annual Report of the, for the Year ending Nov. 30, 1889, with the Registration Report for 1888. New Haven, State. 195 p. 8°.
- DE GUIMPS, R. Pestalozzi: His Life and Work. Tr. by J. Russell, B.A. New York, Appleton. 438 p. 12°. \$1.50.
- NEW JERSEY Geological Survey. Annual Report of the State Geologist for the Year 1889. Camden, F. F. Patterson, Pr. 112 p. 8°.
- OTT, I. Fever, Thermotaxis, and Calorimetry of Malarial Fever. New York, Journ. Mental and Nervous Disease. 54 p. 8°.
- THORNTON, J. Advanced Physiography. London and New York, Longmans, Green, & Co. 338 p. 12°. \$1.40.
- UNWIN, W. C. The Elements of Machine Design. Part I. General Principles, Fastenings, and Transmissive Machinery. 11th ed. London and New York, Longmans, Green, & Co. 459 p. 16°. \$2.
- WESTBROOK, R. B. A Few Plain Words regarding Church Taxation. 2d ed. Philadelphia, Lippincott. 15 p. 12°.
- An Open Letter to Hon. Edward M. Paxson, Chief-Justice of Pennsylvania. Philadelphia, Lippincott. 36 p. 12°.

Old and Rare Books.

Back numbers Atlantic, Century, Harper, and Scribner, 10 cents per copy, other magazines equally low. Send for a catalogue.

A. S. CLARK,

Bookseller,

34 Park Row, New York City.

BACK NUMBERS and complete sets of leading Magazines. Rates low. AM. MAG. EXCHANGE, Schoharie, N.Y.

PRACTICAL ELECTRICAL NOTES AND DEFINITIONS.

For the use of engineering students and practical men by W. P. MAYCOCK, together with Rules and Regulations to be observed in Electrical Installation Work, with diagrams. 130 pages, 32mo, cloth, 60 cts. E. & F. N. SPON, 12 Cortlandt St., New York.

HEAVEN AND HELL. 416 p., paper. DIVINE LOVE AND WISDOM. 383 p., paper. By EMANUEL SWEDENBORG. Mailed, prepaid, for 14 cents each (or 25 cents for both), by the American Swedenborg P. and P. Society, 20 Cooper Union, N.Y. City.

BOOKS

50,000 vols. of ancient and modern rare and scarce books offered for sale. Send for books tried to obtain elsewhere without success. American, British, German and French Books. Catalogues mailed free to Bookbuyers. C. N. CASPAR, Book Emporium 437 E. W. St., Milwaukee

CHEMICAL BOOKS FOR SALE.

ANALYST, London (1887-89, July and November of 1888 missing) 1.80
SUGAR CANE, Manchester (1881-83, 1885-86, also numbers of 1884, 1887, and 1888) 2.40
ZEITSCHRIFT Rubenzuckerindustrie Stammer (1885-86, part of 1887) 1.20
ZEITSCHRIFT Rubenzuckerindustrie Schublers (Vols. xiv.-xvii. inclusive), complete, 2.40
Any of the above will be sent postpaid on receipt of price.

SCIENCE BOOK AGENCY,
47 Lafayette Place, New York.

BOOKS: How to Exchange them for others. Send a postal to the SCIENCE exchange column (insertion free), stating briefly what you want to exchange. SCIENCE, 47 Lafayette Place, New York.

BOOKS: How to Sell them. Send a list, stating condition, edition, etc., to Science Book Agency, 47 Lafayette Place, New York.

THE WINNIPEG COUNTRY;

OR,

ROUGHING IT WITH AN ECLIPSE PARTY.

BY

A. ROCHESTER FELLOW.

(S. H. SCUDDER.)

With thirty-two Illustrations and a Map.
12°. \$1.50.

"The story is a piquant, good-humored, entertaining narrative of a canoe voyage. A neater, prettier book is seldom seen."—*Literary World*.

"This is a sprightly narrative of personal incident. The book will be a pleasant reminder to many of rough experiences on a frontier which is rapidly receding."—*Boston Transcript*.

"The picture of our desolate North-western territory twenty-five years ago, in contrast with its civilized aspect to-day, and the pleasant features of the writer's style, constitute the claims of his little book to present attention."—*The Dial*.

N. D. C. HODGES, PUBLISHER,

47 LAFAYETTE PLACE, NEW YORK

THIRD EDITION.

THE FAULTS OF SPEECH

BY

A. MELVILLE BELL,

Author of "Visible Speech," etc., etc.

The Faults of Speech is a Self-Corrector and Teacher's Manual, for the removal of all Impediments and Defects of Articulation.

60 Cents.

. Sent postpaid on receipt of price,

N. D. C. HODGES, 47 Lafayette Place,
NEW YORK.

the American Academy of Political and Social Science, and will appear quarterly.

—*The Chautauquan* for July presents among its contents "Summer Health: How to keep It," by Felix Oswald, M.D.; "The Newer Parts of Canada," by Cyrus C. Adams; "The House of Representatives," by Eugene L. Didier; "Altruism and the Leprosy," by Frances Albert Doughty; "How to conduct a Round Table," by Edward E. Hale; "What Women should wear," by Mary S. Torrey; "Homesteads for Women," by Kate Carnes; "Madam Blavatsky," by Frances E. Willard; and "New Birds for the House," by Olive Thorne Miller.

—President Jordan of the University of Indiana will contribute to the July *Popular Science Monthly* an article on "Evolution and the Distribution of Animals," in which he shows what bearing the fact of certain animals being found or not found in certain localities has on the origin of species. The ninth of Dr. Andrew D. White's new chapters in the "Warfare of Science" will be published in the same number. Its subject is "The Antiquity of Man and Prehistoric Archaeology;" and it tells how step by step "thunder-stones," or "heaven axes," came to be recognized as flint implements of human make, and how their discovery, together with bones of men and of extinct animals in the drift, established the very early appearance of man upon the earth. This number will also contain an article by August Weismann on "The Musical Sense in Animals and Men," in which he argues, that, "as man possessed musical hearing-organs before he made music, those organs did not reach their present high development through practice in music;" and an article entitled "Concerning Corporation Law," by Amos G. Warner. This last points out the

main defects in the hotchpotch of laws regarding corporations in the United States, and gives four particulars in which our corporation law could be reformed so as to prevent frauds and secure greater responsibility.

—In the July issue of the *Quarterly Journal of Economics* (published for Harvard University by George H. Ellis, Boston), H. Higgs of London will write on Frédéric Le Play, the French social writer and reformer, and will give a specimen of that writer's monographs on workmen's lives. Horace White of New York will discuss the silver situation with reference to pending legislation, and F. B. Hawley will write on the "Residual Theory of Distribution." Edward Cummings, holder of the Paine Fellowship of Harvard University, will have an article on "Co-operative Production in France and England," giving an account, among other matters, of the extraordinary mismanagement of the legacy left by Benjamin Rampal to the city of Paris for the purpose of aiding co-operation. There will be notes by Thomas L. Greene of New York on changes in the form of railway capital, with special reference to the growing use of income bonds; by T. E. Jevons, on the "Mathematical Treatment of the Theory of Distribution;" and by A. C. Miller of Harvard University, on the "Recent Conversion of the English Debt from 3 to 2½ Per Cent Interest." The number will contain the usual general notes and memoranda, and list of recent economic publications.

—Messrs. Ginn & Co. announce a revised edition of the "Hand Book of Latin Writing," by Preble & Parker. The revision extends to almost every page, and includes the results of five years' experience with the book, and of the growth of composition study at Harvard.

A New Method of Treating Disease.

HOSPITAL REMEDIES.

What are they? There is a new departure in the treatment of disease. It consists in the collection of the specifics used by noted specialists of Europe and America, and bringing them within the reach of all. For instance, the treatment pursued by special physicians who treat indigestion, stomach and liver troubles only, was obtained and prepared. The treatment of other physicians celebrated for curing catarrh was procured, and so on till these incomparable cures now include disease of the lungs, kidneys, female weakness, rheumatism and nervous debility.

This new method of "one remedy for one disease" must appeal to the common sense of all sufferers, many of whom have experienced the ill effects, and thoroughly realize the absurdity of the claims of Patent Medicines which are guaranteed to cure every ill out of a single bottle, and the use of which, as statistics prove, *has ruined more stomachs than alcohol*. A circular describing these new remedies is sent free on receipt of stamp to pay postage by Hospital Remedy Company, Toronto, Canada, sole proprietors.

A TEMPORARY BINDER

for *Science* is now ready, and will be mailed postpaid on receipt of 75 cents.



This binder is strong, durable and elegant, has gilt side-title, and allows the opening of the pages perfectly flat. Any number can be taken out or replaced without disturbing the others, and the papers are not mutilated for subsequent permanent binding. Filed in this binder, *Science* is always convenient for reference.

N. D. C. HODGES,
47 Lafayette Place, N. Y.

BOOKS: How to get them. If there is any book or pamphlet that you want, write to the Science Book Agency, 47 Lafayette Place, New York.



DO YOU INTEND TO BUILD?

We offer an Atlas of **Sensible Low Cost Houses**, a portfolio 11x14 inches, containing **handsome illustrations**, floor plans, and full descriptions of this popular design, and fifty-four others, ranging in cost from \$800 to \$7,200. This specimen design is for a cottage with seven rooms, and costing \$1,100. It combines beauty and comfort, has two large porches, and is a popular and practical working design, having been built several times for its estimated cost.

No matter what style of a house you may intend to build, it will pay you to have this book.

We will send this Atlas, postpaid, on receipt of price, \$1.—N. D. C. Hodges, 47 Lafayette Place, New York.

At Siasconset, Nantucket Island, 36 FURNISHED COTTAGES.

\$120 TO \$275 THE SEASON.

Ocean views; surf bathing; no hot days, malaria or mosquitoes. Circulars.

DOUBLEDAY,

39 Ann Street, New York.

RUPTURE

cured in stipulated time.

NO DELAY FROM WORK. NO OPERATION.

Call or send stamp for circular and reference of those cured. We have on hand over 200 styles of trusses, from \$1 up, and suspensories of all kinds. Orders filled by mail or express to any part of the United States.

C. A. M. BURNHAM, M.D.,
138 Clinton Place, New York.

Readers of Science

Corresponding with or visiting Advertisers, will confer a great favor by mentioning this paper.

CATARRH

Catarrhal Deafness—Hay Fever.

A NEW HOME TREATMENT.

Sufferers are not generally aware that these diseases are contagious, or that they are due to the presence of living parasites in the lining membrane of the nose and eustachian tubes. Microscopic research, however, has proved this to be a fact, and the result of this discovery is that a simple remedy has been formulated whereby catarrh, catarrhal deafness and hay fever are permanently cured in from one to three simple applications made at home by the patient once in two weeks.

N.B.—This treatment is not a snuff or an ointment; both have been discarded by reputable physicians as injurious. A pamphlet explaining this new treatment is sent free on receipt of stamp to pay postage, by A. H. Dixon & Son, 337 and 339 West King Street, Toronto, Canada.—*Christian Advocate*.

Sufferers from Catarrhal troubles should carefully read the above.

GEMS AND PRECIOUS STONES OF NORTH AMERICA:

A popular description of their occurrence, value, history, archæology, and of the collections in which they exist; also a chapter on pearls, and on remarkable foreign gems owned in the United States. By GEORGE FREDERICK KUNZ. Illustrated with eight colored plates and numerous engravings. Price, \$10.

Mr. Kunz, who is well known as an authority upon the subject of gem stones, and who is the expert for Tiffany & Co., possesses peculiar facilities for the preparation of a work of this kind.

Sent postpaid on receipt of price.

N. D. C. HODGES, 47 Lafayette Pl., N. Y.

JUST PUBLISHED.

POPULAR MANUAL OF VISIBLE SPEECH AND VOCAL PHYSIOLOGY.

For use in Colleges and Normal Schools. Price 50 cents. Sent free by post by

N. D. C. HODGES, 47 Lafayette Place, New York